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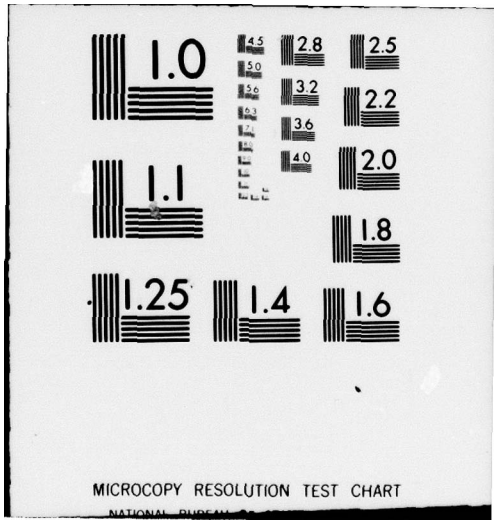
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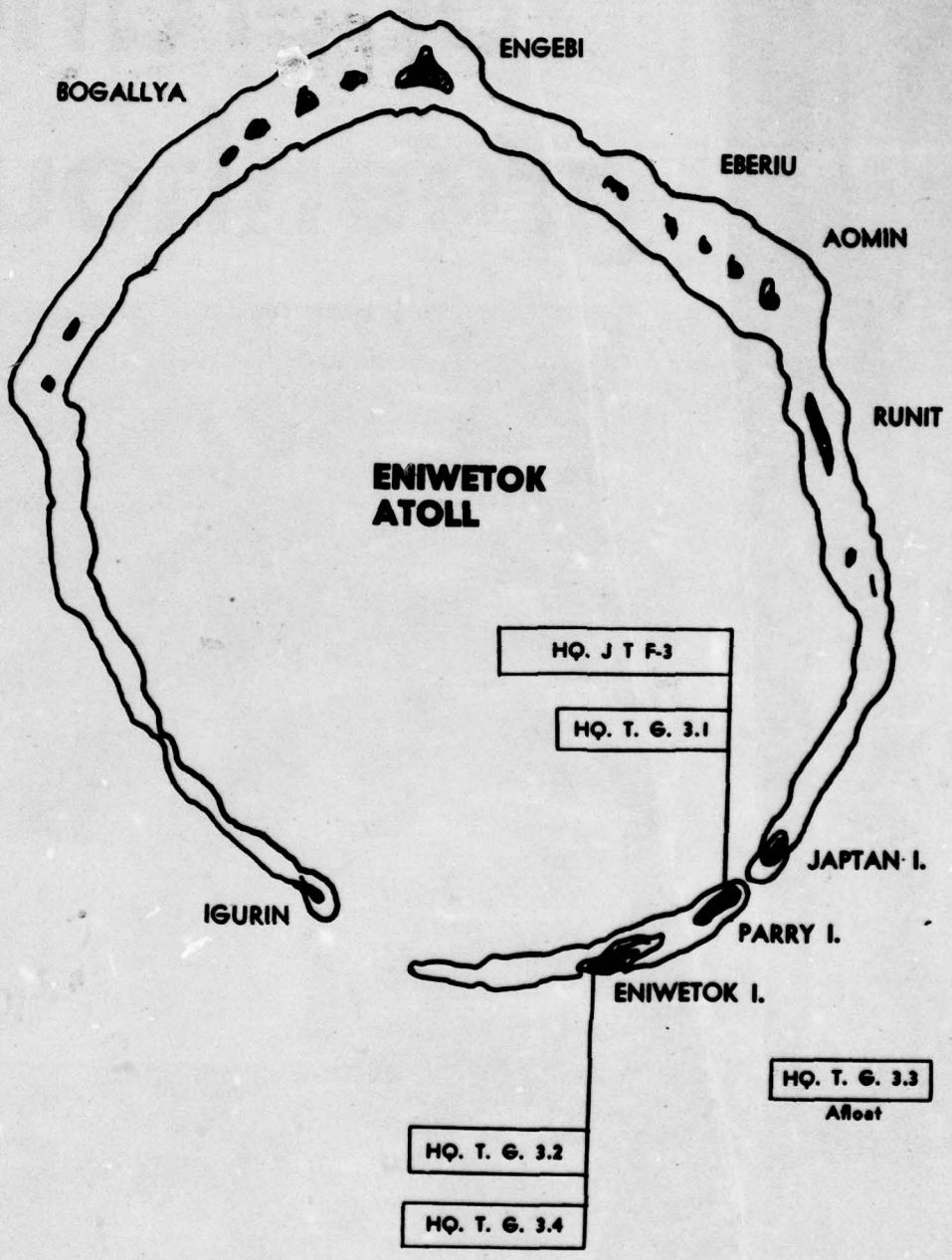
JOINT TASK FORCE THREE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OPERATION GREENHOUSE

Joint Task Force Three

HEADQUARTERS
JOINT TASK FORCE THREE
MAIN NAVY BUILDING · WASHINGTON 25, D. C.

TO THE OFFICIAL OBSERVERS OF OPERATION GREENHOUSE:

Welcome to Operation GREENHOUSE.

For the past two years members of the Atomic Energy Commission and of the Armed Forces have been working together with Joint Task Force THREE to make Operation GREENHOUSE a success. This experiment that you will observe will be history-making. Since the first atom bomb was detonated in New Mexico in July of 1945, there have been a total of less than a dozen atomic weapons exploded by the U. S. Government. Because of severe security regulations, the number of nuclear weapons tested on this operation cannot be disclosed at present. It is planned to make an announcement of the test to the public upon completion of Operation GREENHOUSE.

This booklet is written especially for you. It gives a concise report of some of the efforts that have gone into the operation. We have purposely omitted SECRET information, but we plan to present that information to you during your visit to Eniwetok Atoll.

I can assure you that every effort will be made by JTF-3 personnel to provide you with the best facilities possible.

I hope that during this operation I may have the opportunity of talking with each of you personally.

E R Quesada

F. R. QUESADA
Lt. General, United States Air Force
Commander

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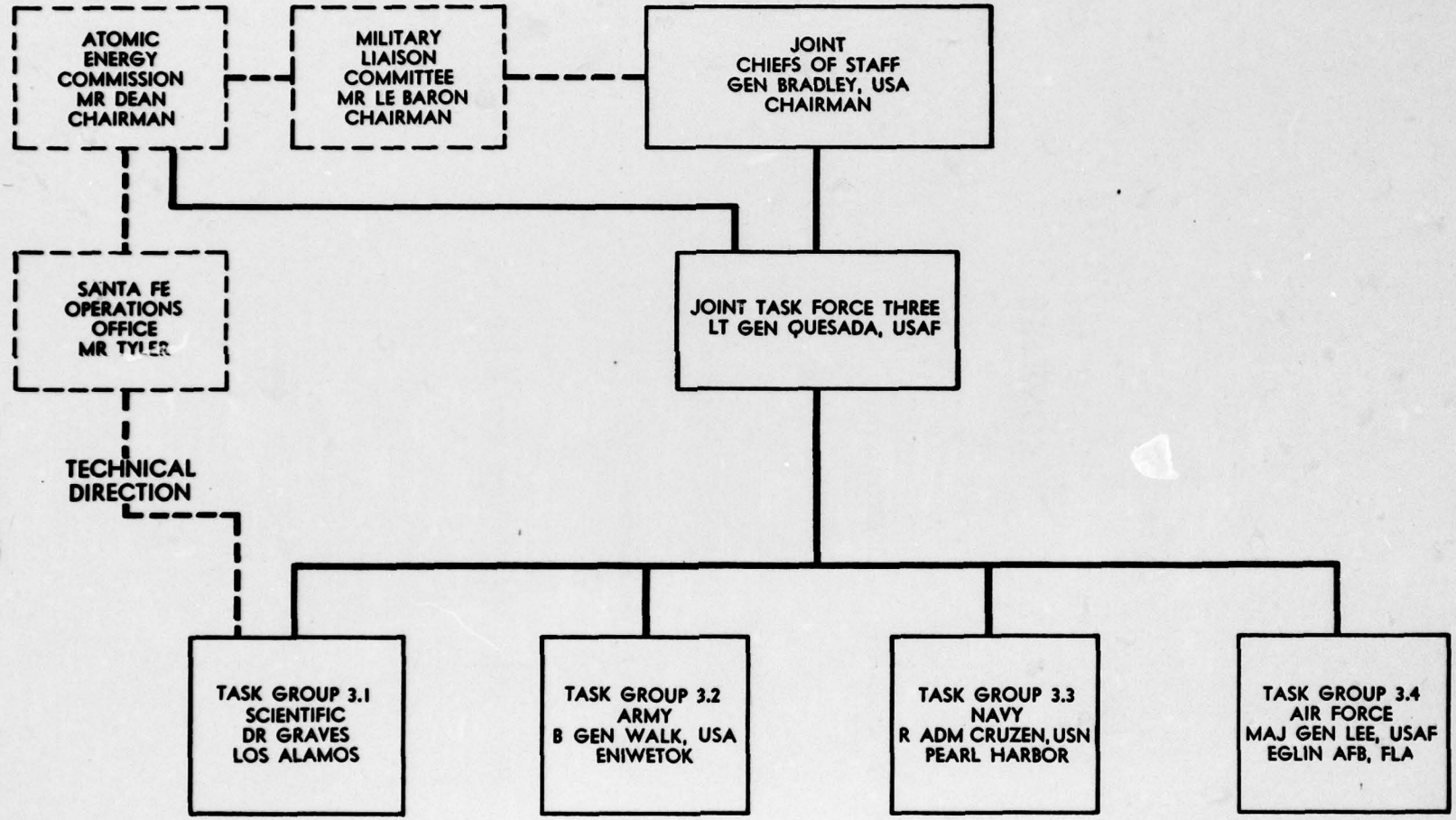
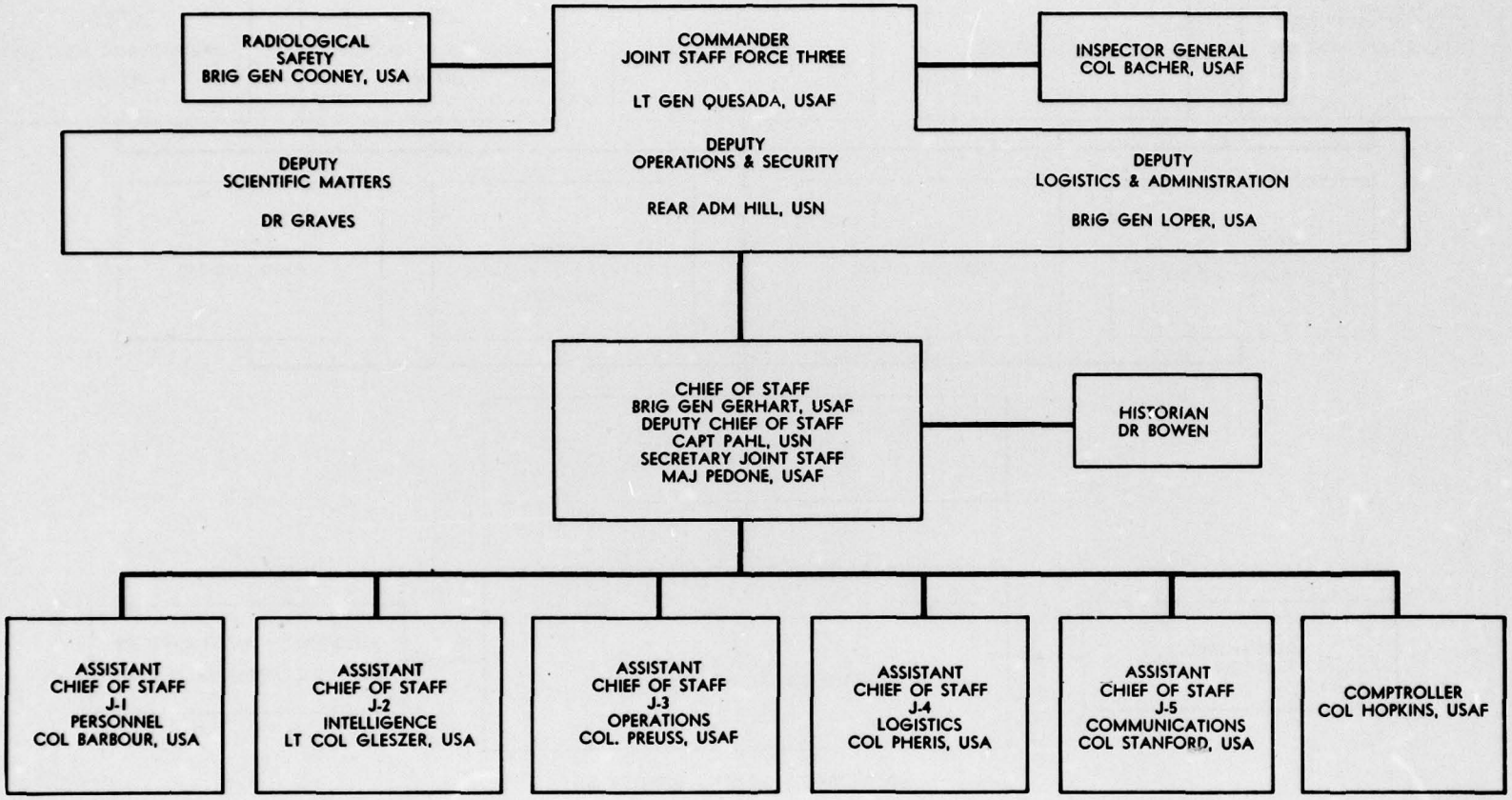
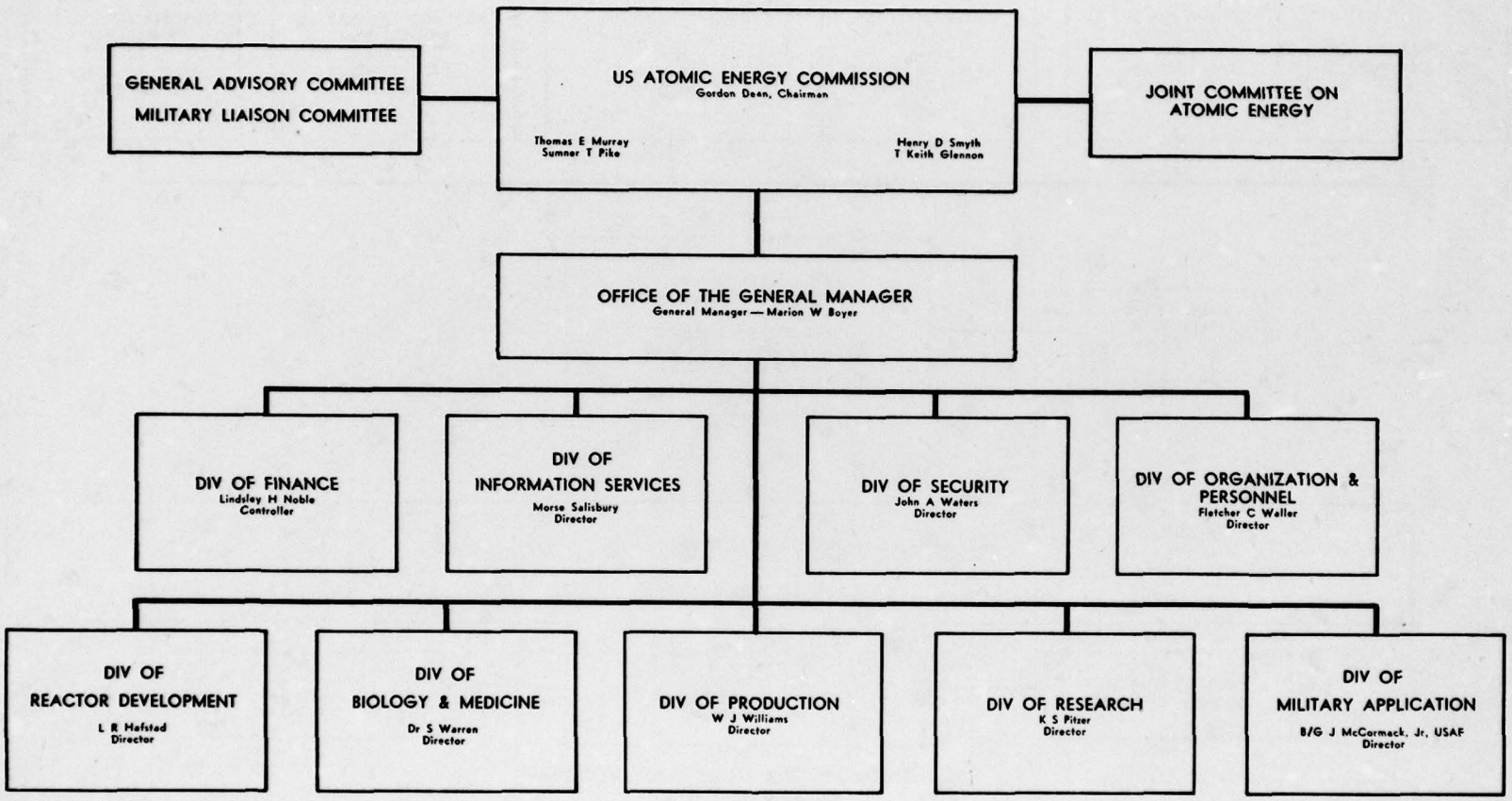
JOINT TASK FORCE THREE



ORGANIZATION
HEADQUARTERS, JOINT TASK FORCE THREE



US ATOMIC ENERGY COMMISSION



I

DEVELOPMENT OF OPERATION GREENHOUSE

Plans for OPERATION GREENHOUSE, executed by *Joint Task Force Three* (JTF–3), were begun soon after the conclusion of *Operation Sandstone* in 1948. The concept of GREENHOUSE evolved from general assumptions—on the part of top level personnel among the military and the Atomic Energy Commission (AEC) and its contractors—that further tests would be necessary.

In July 1948 a permanent proof test division under the direction of Dr. Alvin C. Graves was established, utilizing members of the Los Alamos Scientific Laboratory. On 22 November 1948 the Military Liaison Committee (MLC), acting for the Department of Defense, requested AEC to make official notification of the tests fifteen months in advance so that the JCS could designate a Joint Task Force Commander at least 1 year prior to the target date.

The MLC, on 15 April 1949, addressed a memorandum to JCS stating that plans for the future tests had progressed to the point where important decisions had to be made soon. The MLC recommended that JCS formally commit the military to joint action with AEC and to accept certain principles. The recommendations of MLC were approved by the JCS 2 May 1949. By 6 May 1949 the JCS had approved the recommendation of General Hoyt S. Vandenberg, Chief of Staff, USAF, that Lt. Gen. Elwood R. Quesada be appointed Commander *Joint Task Force Three.*

In addition, JCS designated the Chief of Staff, USAF as their Executive Agent and informed General Quesada that he in turn would be assisted by Deputy Commanders representing the Army and Navy. Before the end of June, JCS approved the nomination of Brig. Gen. Herbert B. Loper and Rear Adm. T. B. Hill as the Deputy Commanders. These two officers and with the two representatives from AEC, namely Dr. A. C. Graves and Col. Paul T. Preuss, USAF, constituted a Joint Proof Test Committee under the chairmanship of General Quesada. During the next few months this committee organized a testing program for the nuclear tests and had taken steps in determining the policies and organization of *Joint Task Force Three*, which had been designated 29 July 1949 by the Chief of Staff, USAF. Ten days later the AEC project was given the code name OPERATION GREENHOUSE.

When organizing JTF–3 the Joint Proof Test Committee recommended that four task groups be organized and to be known as Task Group 3.1, Task Group 3.2, Task Group 3.3, and Task Group 3.4, to represent the AEC, Army, Navy, and Air Force activities.

On 19 October 1949 the Chief of Staff, USAF, as Executive Agent for the JCS, was requested to activate JTF–3 on 1 November 1949. Activation did not occur until 8 November but it was made retroactive to 1 November.

As the plans were underway for conducting the tests at Eniwetok by the AEC and the Department of Defense, plans for building construction and rehabilitating the atoll were in progress. On 16 September 1948 the Manager of Santa Fe Operations dispatched a letter of instructions to Holmes and Narver, civilian contractors for AEC, authorizing a preliminary study of the test site. The purpose of the visit was to formulate a construction program with cost estimates for the next series of experiments. The Holmes and Narver reconnaissance party consisted of experts in mechanical, electrical, sanitary, hydraulic and industrial fields of engineering as well as hydrography and survey.

Their conclusion was that the base facilities at Parry and Eniwetok Islands were neither adequate in extent nor in a proper state of perserva-

General View of the Area.

Constructing Plane Wash Rack.

tion to meet the needs of the personnel conducting the next atomic tests. The flat of the coral shelf on the Pacific side of the islands broke the ocean swell into long surf lines from which the trade winds whipped a spray that deteriorated the metal ferrous structures. Plumbing, too, had seriously deteriorated and refrigeration units were past the point of reconditioning. It appeared to the reconnaissance party that a new type of construction had to be devised and that insect control would have to eliminate wire screens in order to insure proper ventilation during tropical summer months.

The reconnaissance party after studying the semipermanent structures on the islands made the recommendation that the actual design for the new structures would have to be buildings to serve the Atomic Energy Commission and the Department of Defense for a period of five years. It was foreseen the Parry facilities would probably have to accommodate 600 persons. Also, it was predicted that nearly 3,000 military personnel, including the units of an Air Task Group, would have to be housed on Eniwetok Island and existing structures would have to be maintained by expensive repairs or completely replaced.

In search for a better metal from which to prefabricate the type of structures required by the atomic tests, careful attention was given to an airplane dump on the ocean side where wrecked wartime aircraft were deposited. These remains were examined for the effects of corrosion on metal of various kinds. The broken parts of these planes had been long exposed to changing tides with alternate periods of submersion and drying. It was concluded that certain aluminum alloys had proved themselves to be ideal material to withstand the peculiar rigors of the atoll climate.

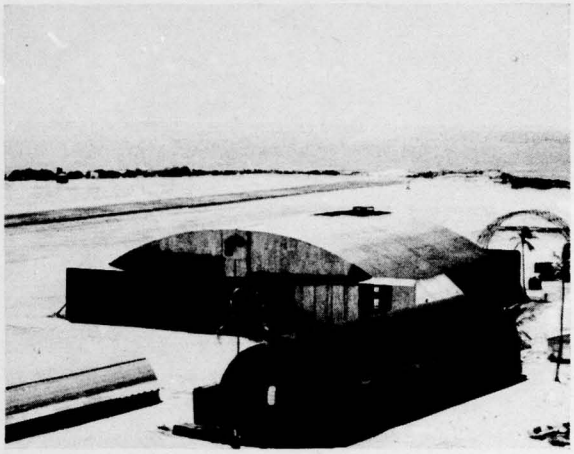
In designing the construction type, Holmes and Narver produced plans calling for a vertical sidewall of aluminum as best resisting corrosion, providing ease of erection and ventilation, while at the same time remaining within initial low cost estimates. It was proposed to erect these structures on concrete slabs using aluminum anchor bolts and connections throughout. These buildings were adapted to almost any desired size and combination using a standard width of 24 feet, entirely free of columns with length as required in 3-foot increments.

To give a visitor an idea of extensiveness of the program which has been undertaken on the Eniwetok Atoll, over 400,000 linear feet of aluminum were used; 197 buildings were erected; over 200,000 linear feet of pipe were laid for fresh and salt water facilities; and 450,000 square yards of asphalt paving were poured.

To support this huge construction program over 100 million pounds of materials have been transported to the site by water, Military Sea Transport Service, with about 150,000 pounds of priority cargo being transported by air freight, Military Air Transport Service.

The permanent power generating facilities of Eniwetok Atoll produces over 3,000 kilowatts, and are enough to operate a city in the United States with a population of about 20,000 persons. Although less than half of that number of people will be on the atoll, the extra power is needed to operate the vast communications system, plus

Raising Arc Into Position at B–50 Hangar.



B–50 Hangar.

operating the many special machines required to accomplish the mission of *Joint Task Force Three.* In addition to the permanent power facilities, six smaller portable generators of 75 kilowatts each have been placed in readiness.

In addition to the Holmes and Narver engineering, procurement and construction program, and in order to conserve Government funds and take advantage of the training opportunity, arrangements were concluded with the Department of the Army whereby the 7th Engineer Brigade with the 79th Engineer Construction Battalion as its main construction force, accomplished the major portion of construction on the island of Eniwetok. This arrangement has functioned splendidly with all parties cooperating toward efficient and expeditious completion of the construction.

To summarize the development of the logistic program at Eniwetok Atoll, it must be said that the effort has been a quadripartite effort on the part of the Atomic Energy Commission, Army, Navy, and Air Force.

The AEC, through its contractor Holmes and Narver, has furnished the engineer know-how, the materials, and conducted the actual construction program on Parry Island and test islands.

The Army has been furnishing its part of the effort by performing most of the construction program on Eniwetok Island, including the runway, hangar, tents, aluminum buildings, roads, clubs, Signal Corps communications system, etc. Certain construction requiring specialized engineering background was performed by the firm of Holmes and Narver. This included the water distillation and power plants. Upon completion of the construction phase at Eniwetok, the Army is furnishing all services normal to a station complement.

The Navy, as part of its effort, is furnishing the security for the atoll, inter-island water transportation, and water transportation of supplies and personnel from the United States and Hawaii to the atoll.

The Air Force, as its part of the program, is furnishing weather information, aircraft for the conduct of the specific missions of JTF–3, air transportation from the United States, inter-island airlift, and is conducting all the technical phases of an Air Force base on Eniwetok Island.

This has proven to be the most economical and most efficient method of organizing and conducting this operation.

II

GENERAL INFORMATION

As your plane approaches Eniwetok Island for a landing, after traveling over 4,400 miles from San Francisco, you will see the very small but also very busy island of Eniwetok. The runway, 7,000 feet long, and the parking ramp for the aircraft cover almost one-half of the island, which is two and one-half miles long and less than one-half mile wide at its widest part. To house the repair equipment and some of the aircraft that will be on the island, a huge hangar, 200 feet square, has been constructed.

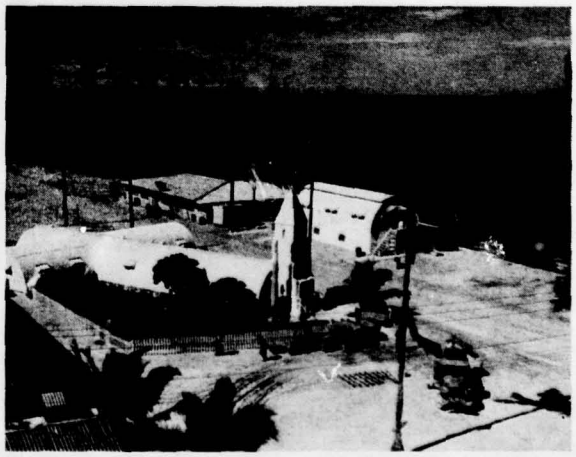
In an effort to hold the population of the atoll to a minimum, the three Services and the Atomic Energy Commission cooperated to make this testing an integrated operation wherever possible. For instance, on Eniwetok Island a single mess is operated, a central exchange is utilized by all personnel on the island, a consolidated supply section has been organized to administer most of the supply needs of the troops, and two open air theaters have been constructed.

Almost 3,000 troops are housed on Eniwetok Island in barracks and in tents. Most of the construction work on Eniwetok Island has been accomplished by troops of the Corps of Engineers. With limited funds available and with a great need for recreational facilities, the Army troops used considerable ingenuity in salvaging material to make the facilities on the island more comfortable. When you tour the island of Eniwetok you will see the many recreational facilities that have been constructed by the men. These include a library, a hobby shop, theaters, a gymnasium, three softball fields, and clubs.

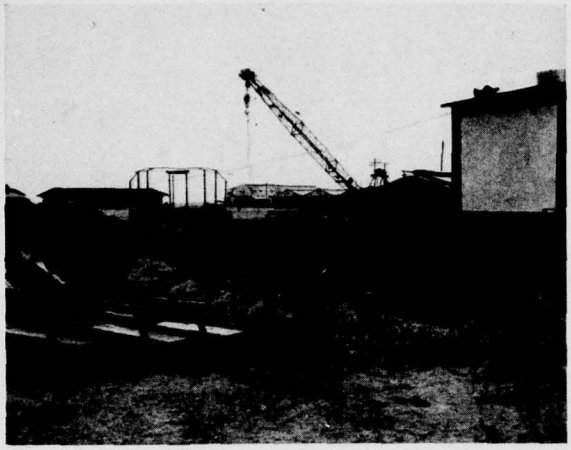
To facilitate the unloading of the tons of supplies arriving at Eniwetok Atoll, cargo piers have been constructed. The piers are large enough to accommodate the small boats that must unload the equipment from the larger ships at anchor in the lagoon.

At Parry Island, where you will be quartered, you will find a large Community Club which is utilized by all personnel assigned to Parry Island. There is a mess hall that seats over 400 people and through a shift system can feed nearly 1,700 men in 2 hours. Parry Island also has a sales store, which has most of the necessary articles required for your comfort during your stay on the island. An open-air theater is available each night which will show the latest movies.

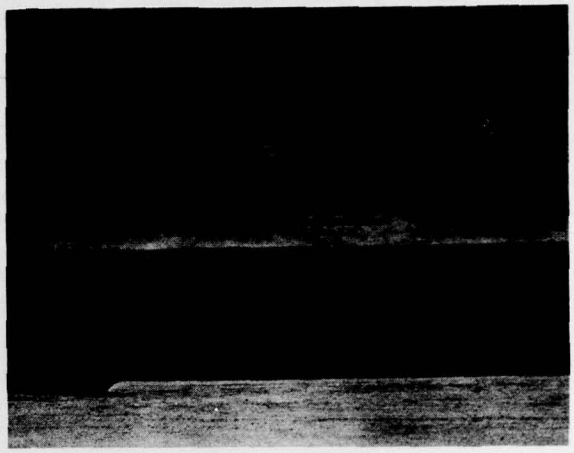
Immediately upon your arrival at Eniwetok Island, you will be met by the official welcoming committee. You will be given a BLACK BADGE which will be displayed by you throughout your stay on the island, and will be turned in just prior to boarding the plane for the return to the United States. Your BLACK BADGE permits you to visit operational islands and areas of Eniwetok Atoll, both ashore and aboard ships when escorted by personnel with the authorized badge for the area involved. Soon after your arrival vehicles will provide transportation to the pier where you will go aboard a boat which will take you to Parry



Chapel, I & E Building and NCO Rocker Club.



Starlight Theater Being Terraced.



Duffy's Tavern.

Island, just north of Eniwetok Island. The bus transportation, the issuance of badges, and the boat trip to Parry will be accomplished in about 1 hour.

Upon arrival at Parry, assignment of billets and other pertinent information will be given to you. You will be housed in aluminum type quarters which are available on the atoll. The quarters are well-ventilated and as roomy as possible, consistent with the economy required. It is planned that each of you will be assigned to a room with one senior member of JTF–3 who will assist you throughout your stay on the atoll. It is felt that this officer will prove advantageous to you in that he will be able to answer your inquiries about the operation.

For your information a bulletin will be given to outline the day's schedule and to inform you of the movies, church services, etc. Your mail or other messages will be distributed through the Special Observer Headquarters. Certain briefings and tour have been arranged so as to make your visit as profitable as possible. On the first day of the final program you will be given a briefing by the Commander, JTF–3 and CTG 3.1, after which you will be given a conducted tour of an appropriate island in the atoll. A lunch will be served en route. That evening will include the Commander's dinner by JTF–3. The following day you will travel by boat to Eniwetok Island and there be briefed by CTG 3.2, CTG 3.3, and CTG 3.4. Included also in the program is a tour of Eniwetok Island and visits to certain specific activities of special interest. Opportunity for a swim will be given you followed by a lunch at one of the clubs. The following day an opportunity will be given you to view a demonstration with appropriate briefings. The details of this program will be distributed after your arrival at Eniwetok Atoll.

III

INFORMATION ON THE MARSHALL ISLANDS

Realizing that newer and more powerful nuclear weapons would be constructed, the AEC began in 1946 to make recommendations for a permanent Atomic Energy Proving Ground outside of the United States. After careful study and close coordination with the other interested agencies, the AEC announced in July 1947 the establishment of an atomic bomb proving ground to be located on Eniwetok Atoll, a small atoll of the Marshall Islands in the Pacific Ocean.

The Marshall Islands archipelago consists of 34 low-lying coral atolls and single islands arranged roughly in 2 parallel rows running from the northwest to the southeast. The easternmost row is called the Ratak Chain and the westernmost is the Ralik Chain. Eniwetok is the most northerly of the Ralik Chain atolls.

Eniwetok Atoll is located at latitude 11°20′ N., longitude 162°20′ E., and is 165 miles westward of the Bikini Atoll. Over 30 small islands comprise the atoll, which is about 20 miles wide and 30 miles long.

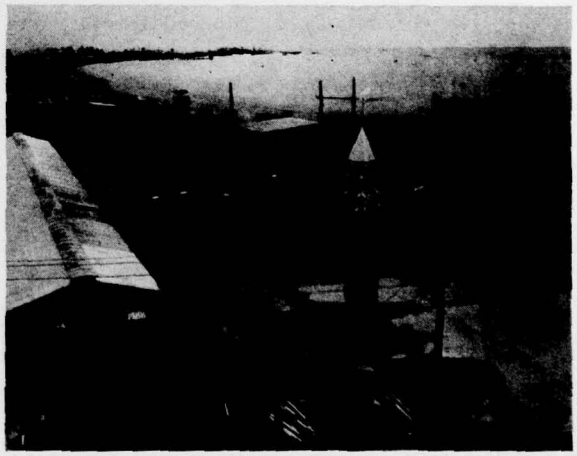
Prior to *Operation Sandstone* which was held in the Eniwetok Atoll in 1948, inhabitants of the atoll were moved to the other islands in the Marshall chain. You will not find any of the natives on Eniwetok Atoll during your visit on this operation; however, the following information is given relative to the Marshall Islands in order to acquaint you with the habits and customs of the people of this area.

Because of its position in the low latitudes, Eniwetok Atoll has a tropical climate of marine type. The temperature is high and remarkably uniform, deviating no more than 1° in any month from the annual mean of 81° Fahrenheit. The diurnal variation is also slight; the highest temperature of the day, usually registered between 1300 and 1400, normally exceeds the lowest temperature, registered between 0500 and 0600, by only 10° or 12°.

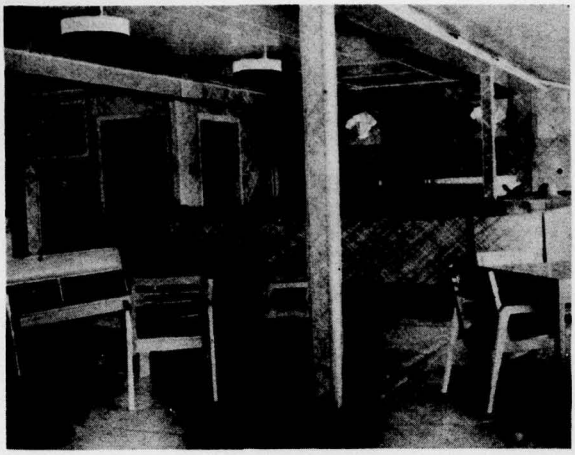
Humidity in the atoll is very high, and shows extremely little seasonal variation. Relative humidity varies somewhat during the day, however, being highest ordinarily about 0600 and lowest about 1400. The mean relative humidity for the entire year is 85 percent.

The tropical heat of the atoll is moderated by strong cooling sea breezes. The northeast trade winds predominate from December to April. The northeast trades are dependable and usually bring fine weather. The wind blows strongest at the height of the northeast trades. During the summer the winds decrease appreciably in intensity and often yields to temporary periods of calm. In an average day the wind is strongest at 0600 and most moderate in the early evening.

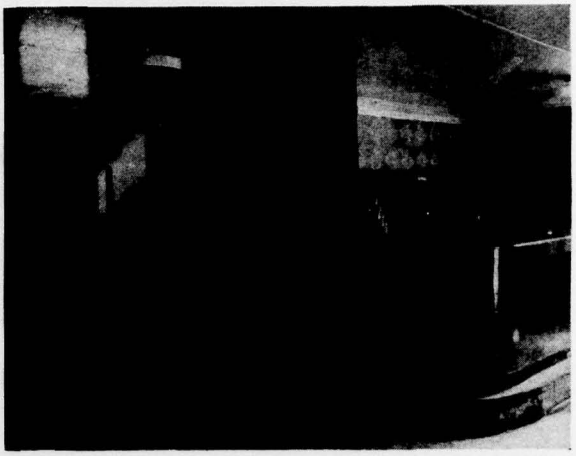
There are no springs or flowing streams in the Marshall Islands, and natural pools and marshes are rare. For the most part, stagnant pools are unfit as a source for drinking water. They are



Constructing NCO Club.



Bar at the Officer's Mess.



Interior of Duffy's Tavern.

often brackish and, moreover, are commonly used for bathing purposes by the natives. The only fresh water in the Marshalls is that which falls on the islands as rain. Since there are long droughts in the northern atolls, the water supply is more meager there than in the southern islands. There is no possibility of any underground artesian source. The rainwater accumulates in the porous subsoil, and forms lenses of fresh water under the larger islands. The natives collect rainwater by placing large receptacles under trees and under the eaves of the house roofs, and they store it in hollowed tree trunks or in modern cisterns or tanks. Since thatched huts of the natives are somewhat unsanitary and are relatively inefficient for the purpose of collecting water, the Japanese encouraged the adoption of roofs made of galvanized iron and other more suitable materials.

Customs

Men originally wore mat and fiber loincloths, which hung down to the knees for dress but were drawn up short as work clothes. Women wore two mat or fiber skirts, one forming a brief apron in front, the other wrapped around the waist from behind. Boys went nude; girls wore only a small apron in front.

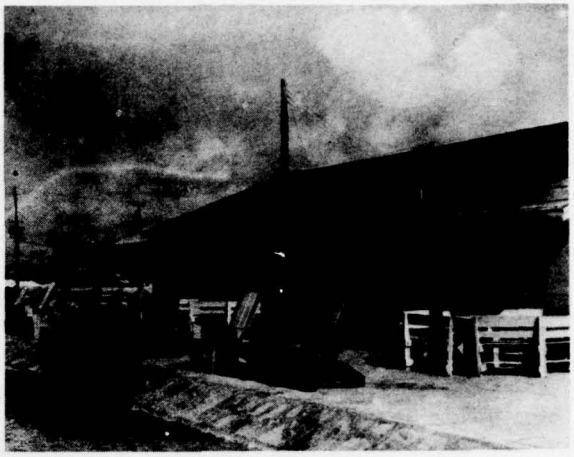
Today, European clothing has almost entirely replaced the native dress. Men wear trousers and shirts, reverting to the loincloth only while fishing or swimming. The women retain the native mat skirts as underclothing and in addition wear ill-fitting imported dresses. Until recently the "Mother Hubbard," with its high neck, long sleeves, and ankle-length skirt was customarily worn by missionized native women.

Men are tattooed on the chest and back; women on the arms and shoulders. Tattooing has a religious and social significance, and is clung to as an important part of native customs. No one may be tattooed without permission from the chief. Facial tattooing may be worn only by the men of the noble class. Aristocratic women are more elaborately tattooed than commoners.

The native diet is predominantly vegetarian, supplemented by fish and shellfish. The stable crops under aboriginal conditions were coconuts, breadfruit, pandanus, taro, and arrowroot, but many new food plants have been introduced. The natives have accepted a number of foreign foods as part of their diet, the most important being bread, rice, hardtack, flour, sugar, tea, and tinned meats and fish. The salting of food is unknown, and there is no market for European salt. Fish and shellfish are eaten daily; turtles are a luxury, and pigs are consumed only on festive occasions. The natives do not eat cats, dogs, lizards, the Muscovy duck, or rats. Fowl have been used as food only recently, the natives still exhibit a repugnance for eggs. Certain fishes are believed by the natives to be poisonous and are never eaten.

As a result of the strong influence of American missionaries, the attitude toward Americans is generally favorable, especially among the native Christians. Since the teaching of history has been prohibited in the mission schools, much of the knowledge of America has presumably been acquired in a distorted form in the Japanese public schools. Contacts with missionaries and evangel-

Terrace at Officer's Beach Club.



Terrace of Duffy's Tavern.

ists, however, have probably operated to some extent as a corrective. The example of the missionaries has doubtless led the natives to expect Americans to be kindly, earnest, and well-mannered people with strong moral prejudices.

Social Classes

The Marshall Islanders are divided into a series of social classes, which are derived directly from the native political organization and system of land tenure. These class distinctions were extraordinarily marked in the early days and, though somewhat disintegrated today, are still of considerable significance. The primary division is into a noble or aristocratic class and a common or servile class, the latter being much the more numerous. In addition to these two fundamental social classes, there are two special class divisions of importance. The first of these is a royal subclass, a subdivision of the nobility which consists of paramount chiefs and their near matrilineal kinsmen. The other is a knightly subclass, composed of persons of common origin who have been awarded the privileges of upper class for life in return for meritorious service or special knowledge.

During World War II Eniwetok Atoll took a pounding from the United States Forces during *Operation Catchpole* which began 17 February 1944. To neutralize the entire atoll, which is approximately 70 miles of coral reef, the decision was made to capture Engebi, in the north, and Eniwetok and Parry, in the south. For 4 long days the Japanese suffered continuous bombing from US naval ships. The ships played their searchlights on Engebi, Parry and Eniwetok throughout the nights so that the enemy could not escape from one island to the other. Many attempts were made by the Japs to traverse the route from Eniwetok to Parry, the same course that you will take. On the morning of 21 February 1944 the Stars and Stripes were raised atop a frazzled, decapitated palm tree. By 27 February United States Fighters were operating from the airstrips on the atoll. To show the complete pulverization that took place during the atoll fighting, 3,334 Japanese were killed out of a population of 3,400. Total American casualties were 716.

Such is the historical background of the area in which JTF–3 will conduct Operation Greenhouse, the third operation of a series of experiments to test the characteristics of the newest atomic weapons. The tests being held are primarily scientific, under the direction of the Atomic Energy Commission. *Joint Task Force Three*, commanded by Lt. Gen. Elwood R. Quesada, USAF, has been designated by the JCS to conduct these tests. General Quesada has further been designated to be over-all representative of the Atomic Energy Commission during the operation overseas.

On 29 November 1949, the Department of Defense and the Atomic Energy Commission advised the President that a new series of tests of atomic weapons was being planned for the Commission's providing grounds at Eniwetok Atoll in the Marshall Islands.

IV

HAZARDS RESULTING FROM ATOMIC BOMB EXPLOSIONS

Nature of Hazards

When an atomic bomb explosion occurs, a tremendous quantity of energy in a variety of forms is released. This energy is propagated outward in all directions.

When fission occurs, the immediate reaction is intense emission of ultra-violet visible and infrared (heat) radiation, gamma rays and neutrons. This is accompanied by the formation of a large ball of fire. The largest part of the energy from the explosion is emitted as a shock wave. The ball of fire produces a mushroom-shaped mass of hot gases, the top of which rises to about 10,000 feet in the first minute and about 30,000 feet in 5 minutes. In the trail below the mushroom cap, a thin column is left. The cloud and column are then carried downwind, the direction and speed being determined by the direction and speed of the wind at the various levels of air from the surface to 50,000 feet (or higher) altitude.

Sunporch of Swimmer's Tavern.

All personnel of the Task Force will be well outside of the range of all hazards at the time of detonation, except from the intense light from the fire ball.

Following the detonation, personnel entering shot areas will be exposed to beta particles and gamma rays coming from induced neutron activity in the soil and any fission products which might have been deposited on the ground. There may also be a potential alpha particle hazard from the unfissioned fissionable materials which may be deposited on the ground.

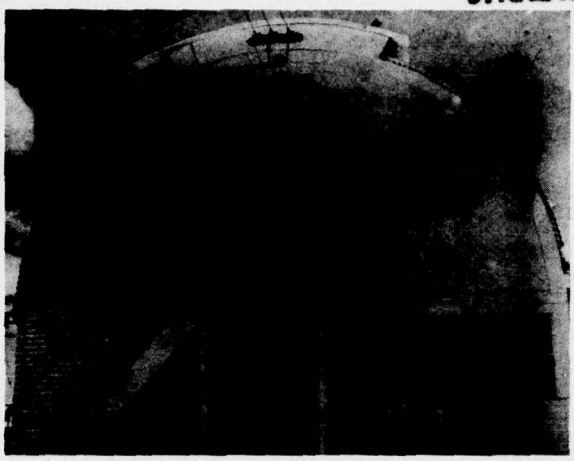
The light of explosion is so intense that temporary blindness may occur through facing the ball of fire, unless the eyes are protected by dark glasses.

The emission of dangerous nuclear radiation can be separated into two time periods. The primary radiation which occurs at the time of the flash is composed of gamma rays and neutrons. Casualties may result from this primary radiation if the exposure occurs within 2,000 yards of zero.

Protection

Against the primary radiological effects, distance will provide protection.

Against the secondary radioactivity hazards from radioactive fission products, induced radioactivity and unfissioned residue, *detection* and *avoidance* provide the best protection. Suitable instruments indicate directly both the presence and intensity of radioactivity at a given place. Area reconnaissance, the maintenance of contamination situation maps, the posting of areas of hazard and minimizing the spread of contaminated material into uncontaminated areas constitute the active measures for reducing the radiological hazard.



I & E Office.

Inside New Commissary.

Personnel within 15 nautical miles and who are to be facing in the direction of the flash will be required to wear special goggles to protect their eyes against excessive light. Personnel within 15 nautical miles who are not provided goggles will face in the opposite direction from the flash.

Anticipated Hazard Areas

Immediately under the bomb burst there will be an area of intense radioactivity roughly 500 yards in radius.

Extending downwind, an airborne radioactive hazard will exist. Its characteristics will depend on the meteorological influences such as wind, speed, and direction at various altitudes up to the maximum height reached by the cloud.

Contaminated water in the lagoon adjacent to the shot island should be of no consequence, but will be checked by the Radiological Safety Unit of TG 3.1.

All individuals or objects leaving contaminated areas may transfer radioactivity to clean areas.

By means of instruments, such as Geiger-Mueller counters and ion chambers, it is possible to detect the area of contamination and to measure the intensity of the radioactivity. Radiation intensity will be measured and reported in roentgens per hour. Besides these instruments, dosimeters and film badges will be used as indicators of the accumulated exposure to radioactivity. Personnel will wear film badges to provide a permanent record of exposure.

The intensity of the radioactive hazard tends to decrease with time due to decay of radioactive materials, and dispersion and dilution depending upon climatic conditions. As an approximation, the intensity of the radiation from the fission products decreases by radioactive decay inversely with the time after the detonation. An area which has 15 roentgens per hour at 1 hour after detonation would have an intensity of 7.5 roentgens at 2 hours after detonation and 5 roentgens at 3 hours.

Clearance

No visiting personnel will be allowed into a contaminated area until clearance is obtained from JTF–3. All such parties will be accompanied by a rad-safe monitor.

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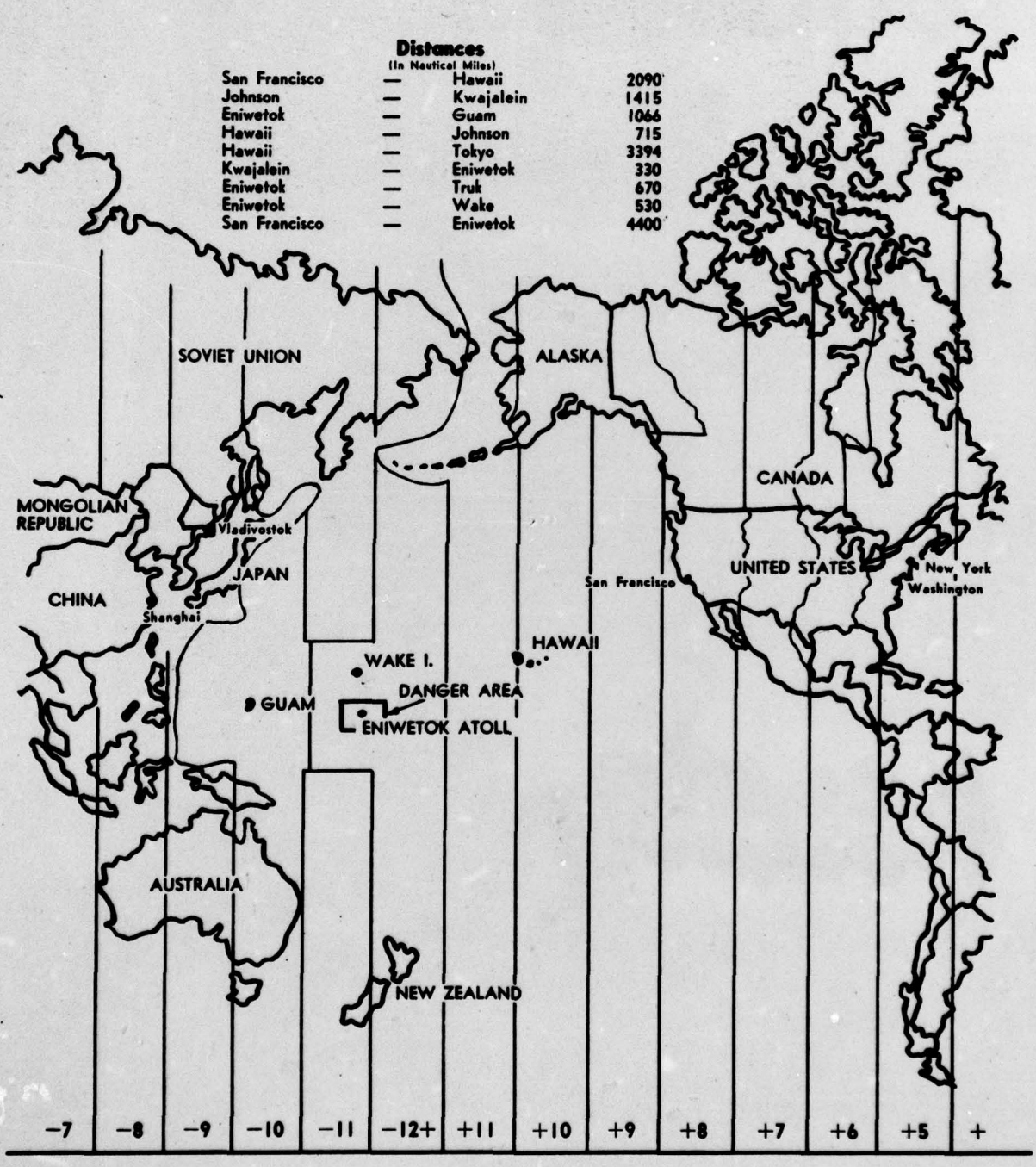
Distances
(In Nautical Miles)
San Francisco — Hawaii 2090
Johnson — Kwajalein 1415
Eniwetok — Guam 1066
Hawaii — Johnson 715
Hawaii — Tokyo 3394
Kwajalein — Eniwetok 330
Eniwetok — Truk 670
Eniwetok — Wake 530
San Francisco — Eniwetok 4400
SOVIET UNION
ALASKA
CANADA
MONGOLIAN REPUBLIC
Vladivostok
JAPAN
CHINA
Shanghai
UNITED STATES
San Francisco
New York
Washington
HAWAII
WAKE I.
DANGER AREA
GUAM
ENIWETOK ATOLL
AUSTRALIA
NEW ZEALAND
−7
−8
−9
−10
−11
−12+
+11
+10
+9
+8
+7
+6
+5
+